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CONSCIOUSNESS, THE SENSE ORGANS, AND THE NERVOUS SYSTEM[1]

IN articles already published[2] I have suggested that if we directly question reflective experience as to what consciousness is, we get the answer that it can not be identified with the objects of that experience, but is to be identified with a relation between them, and that this relation is the relation of meaning or implication, in short, the logical relation. In other words, I have taken the fact of meaning to be the fact of consciousness, and urged, consequently, that consciousness is just the existence of logical relations. If all the rest of experience existed, but these relations did not exist, I am of the opinion that we should not be warranted in describing such a situation as one in which there is consciousness of anything. These conclusions were based on a direct analysis of reflective experience without considering the relation of the organism which is said to be conscious to its surroundings. It is natural, however, to expect that such a consideration would have important bearings on these conclusions. For if we are entitled to believe that consciousness is a result of the interaction between the organism and its surroundings, the ways in which this interaction is effected should not be irrelevant to the conclusions reached by the analytic study.

It is pertinent to ask, therefore, How is that interaction between the organism and its surroundings effected which results in conscious experience? The answer is old and obvious. It is effected by means of the sense organs and the nervous system.[3] By these means what the organism in interaction with its surroundings undergoes, is made into a conscious experience.[4] I desire, therefore, to emphasize certain well-known facts about the structure and functions of the sense organs and the nervous system, and to point out that they lead to conclusions in suggestive conformity with those drawn by other means.

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[1] This article is a revision of a paper read before the meeting of the American Philosophical Association, at Baltimore, in December, 1908, as a contribution to the discussion of idealism and realism.

[2] "The Nature of Consciousness," this JOURNAL, Vol. II., p. 119, and "The Problem of Consciousness" in "Studies in Philosophy and Psychology: The Garman Commemorative Volume," p. 137. See also "Consciousness and Meaning," in *The Psychological Review*, Vol. XV., p. 397.

[3] I limit the consideration here to the human organism for the sake of clearness in the general exposition.

A superficial examination of the sense organs and the nervous system reveals a striking difference in structure and function which becomes more striking the more thorough the examination is made. Thus the sense organs appear to be constructed and differentiated in relation to specific differences in the stimuli which may affect them, while the nervous system appears to be constructed and unified in relation to coordinated activity by the organism. While the sense organs put the organism in diversified interaction with its surroundings, the nervous system prevents this diversification from resulting in disintegrated and isolated reactions. It is thus apparent that the nervous system secures to the organism individuality and unity of life in spite of very great diversity of stimuli and environment. We have in these considerations, I believe, the means of stating the relational view of consciousness in biological terms. An organism so situated that it should be in differentiated interaction with the specific differences in the world about it, but which should, none the less, react in a unified and coordinated manner no matter how it might be stimulated, might well be defined as a conscious organism. Its consciousness would be a relational system integrating and unifying its differentiated interaction with its surroundings. Furthermore, its consciousness would naturally be marked by many of the characteristics usually attributed to consciousness. It would, for instance, be what we call individual and personal, and, being unified, it would present features often ascribed to a self or a mind. Different organisms could readily be conceived as exhibiting those varieties and even abnormalities of experience with which we are familiar and which appear to be due to individual differences in structure or circumstances. On some of the basal features of this general view I wish now to be more explicit.

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[4] Lest there may appear in this statement a forgetfulness of the question, How can such interaction produce consciousness? I beg to refer the reader to the following words of Dr. Adolf Meyer: "We admit that we do *not* know *why* certain combinations of molecules of definite kind form a constellation which implies with necessity the phenomena of electricity. It is a fact which we accept as a fact of experience. Those who are trained to make the dualistic division between mental experiences or occurrences, and physical ones, merely *assume* that they can understand *why* such constellations of certain metallic stuffs as the above mentioned, go with the phenomena of magnetism, others with the phenomena of electricity, etc.; and they refuse to see that the biological events of the order of mentation are no doubt in a similar way dependent on sufficient organization and constellation of an organism and that the coexistence of these constellations with their manifestations is a fact we have to accept as merely *one instance* of the general problem of the qualitative differentiation of the universe. The question why mind is mind, and just what it is, can be as little answered as what gold is, and why it is and why it should be so. Consequently, the impossibility of getting an answer to the puzzle—what makes mind mind, and what the relation is between the underlying physical constellations and the 'result'—is only part of the problem why the world is organized as it is. Our inability to answer that does not imply that we are any worse off in regard to mind than with other facts of quality which we accept without puzzle, satisfied if we can determine the *conditions* of their occurrence; and it does not follow that for this reason, mind must be something quite different from the rest of experience, provided that we realize that it presupposes sufficient organization and opportunities of work." *Psychological Bulletin*, Vol. VI., p. 177. The reader is referred to the article from which these words are taken for a discussion of consciousness analogous to the present study.

That the specific structure of a given sense organ disappears in its corresponding sensory nerve is a fact frequently commented upon. The eye is an optical apparatus, but not so the optic nerve. While the sensory nerves may be specifically habituated to the activities of their corresponding organs, they none the less present a similarity of structure and function in marked contrast with the diversification of the organs themselves. We seem, therefore, forbidden to attempt to account for the differentiation of the organs without assuming a corresponding differentiation in the stimuli which affect them, and forbidden also to assign to the sensory nerves the particular functions which the organs themselves fulfill. It is the eye, not the optic nerve or its cortical center, which sees; it is the ear, not the auditory nerve, which hears. Thus the general lack of structural continuity between the sense organs and their nerves points, it seems to me, on the one hand, to the fact that the organism is related in specifically different ways to specific differences in its surroundings and, on the other hand, to a radical difference in function between the organs and their nerves. The organs possessing structural differences of specific character are, properly, specifically sensory, while the nerves, just because they lack these structural differences, are not.

Turning our attention to the organs exclusively, I repeat the observation that they point to specific differences in the surrounding world. In other words, it would appear that there are specific differences in the surrounding world with which the organism would not be in interaction unless there were organs by means of which this interaction is brought about. Or, if I may speak in what is often regarded as the objectionable language of teleology, the organs exist for the purpose of realizing interactions which, otherwise, would not be realized. Eyes would be useless unless there were something to see. Accordingly we may not account for vision by pointing to the structure and functions of the eye alone. The structure is adaptive and the function interactive. Seeing would thus appear to be, not a process set up exclusively in the organism itself, but an interaction or relation between the organism and its surroundings effected by means of the eye. It is not a reaction solely, but an interaction as well.[5] Sensation in general, it appears to me, should be similarly described.

If we identify sensations with the specific kinds of interaction which may be brought about by specific organs, sensations appear to be robbed of much of the mystery with which they have often been clothed. They may not, with Locke, be described as an order of existences intervening between a supposed mind and a supposed world. They need no mysterious process of projection in order that they may appear to constitute an outer world without really doing so. It is natural to them to be objective. It is natural that we should not find them in the brain—or perhaps I should say it is natural that we should find only a brain when we examine a brain —and that we should find them constituting in large measure the objects of the world in which we live. They would appear to be natural events of the same general status with all other natural events. They are not knowledge any more than an eclipse of the moon is knowledge. They are, like such an eclipse, objects to be studied, the antecedents and consequents of which it is the business of knowledge to discover.[6] Since, therefore, the structure and functions of the sense organs provide for a variety of interactions between the organism and its surroundings, they appear to me to account thereby for the sensory content of experience without the addition of any faculty or power of sensibility, simple apprehension, or awareness. The bare existence of the interactions thus constituted appears to be the fact of sensation.

In the light of these considerations the distinction between primary and secondary qualities may indeed be regarded as sound, but also as requiring restatement. The restatement should be made, not in terms of epistemology, but in terms of causation. In order, that is, that certain specific differences in the world may have their specific effects there must be some means provided for their specific causality to operate. Without such means, the differences might well exist, but lack their appropriate efficacy. Such means may well be the sense organs or structures analogous to them. For instance, a landscape may in itself have all the variety of its objects and their relative positions which we ordinarily ascribe to it, but this variety may fail to affect the sensitive plate in a camera as a variety of objects in relative positions unless a lens is interposed. Thus we approach the primary qualities of things as we rob things more and more of their specific differences. Secondary qualities are those which require the intervention of some special structure if their appropriate causality is to be effective. This view preserves the important distinction between primary and secondary qualities, but by explaining the distinction in terms of causation removes it from the perplexities of epistemology. Furthermore, if this interpretation of the distinction is correct, sense organs or similar structures may be necessary to make the secondary qualities effective according to their specific characters, and yet not force us to conclude that the existence of these qualities is subjective.

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[5] Compare the article by Professor Dewey on "The Reflex Arc Concept in Psychology" in *The Psychological Review*, Vol. III., p. 357.

[6] Compare the article by Dr. Bush on "Knowledge and Perception," in this JOURNAL, Vol. VI., p. 393; and compare also my own article, "Perception and Epistemology," in "Essays Philosophical and Psychological: in Honor of William James," p. 137.

So far, then, as the sensory content of experience is concerned, the view here outlined suggests that that content is amply provided for by the existence of specific means for rendering the differences in the world effective according to their specific characters. In order, therefore, that what we are wont to call sense qualities may exist, consciousness would appear to be unnecessary. Such things as colors and sounds could operate according to their own nature anywhere within the sphere of their influence provided only there existed the appropriate means for making such operation effective. And what on this view appears true of colors and sounds appears to me to be true also of all varieties of sense qualities.

Important, therefore, as the existence of sense organs may be for the richness and variety of our conscious life, sense qualities do not appear of themselves to constitute that life. Did our sense organs exist in isolation and remain only disconnected media for specific causation, the world might possess all the variety we ascribe to sensation, but contain no more consciousness than exists in a camera when the sensitive plate is exposed. But they exist neither in isolation nor disconnection. We possess them in number and they are connected by a most intricate mechanism, the mechanism of the nervous system.

When we turn to examine this mechanism, we are impressed by the fact, already noted, that it does not possess the specific structural differences characteristic of the sense organs. It would, therefore, appear to play no part in the production of sense qualities. To be sure we distinguish between sensory and motor nerves, but the distinction seems to be based on differences in terminal endings or in the direction of what we call the nerve current rather than on any radical difference in function. The service which the nervous system, as a whole, and the brain in particular, fulfills, seems to be that of connected and coordinated reaction. By means of this mechanism the organism is enabled to react as a whole and in a coordinated manner to any stimulus no matter by what organ that stimulus is received and no matter what may be its specific quality. A given stimulus produces, thus, not only its appropriate sense quality, but also induces, on the part of the organism, a reaction which is not confined solely to the sense organ affected, but which involves in some measure the entire organism itself. In other words, the organism with its sense organs and its nervous system provides a center for the connected interplay and coordination of the varied differences in the world without allowing these differences to lose their specific characters. In such a statement we have, I venture to believe, a biological expression of the nature of consciousness. Its similarity to the analytic expression made at the beginning of this paper is, I think, apparent. For an organism so situated that differences in stimuli should, none the less, produce in it coordinated and unified reactions would be an organism in which the reception of stimuli would involve adaptive and even prospective adjustments. In other words, sense qualities would become indexes of a variety of possible reactions and thus be connected in the relation of implication.

The nervous system is, moreover, not only a mechanism for connection and reaction, but it is also a mechanism with an activity in a measure independent of the activity of the sense organs. For the nervous system is also a connection and coordination of nerve centers culminating in the brain. Stimuli produce not only adjustments external to the organism, but also internal systematization of connection. Thus the organism as a center for the connected interplay and coordination of the varied differences in the world is such a center in conjunction with a highly specialized and integrated life of its own. It is thus able to preserve, in spite of changing stimulation and environment, an individual stability. It thereby conserves its own past and draws upon it in its own reactions. It has, consequently, a peculiar efficacy of its own which is not to be explained solely in terms of the stimuli affecting it, and which presents those features of spontaneity and initiative so characteristic of conscious beings. To set a limit to the system of intricate natural connections which may be effected as a result of the equipment of the organism in relation to its environment is impossible. The richness of the life thus engendered baffles the imagination. It seems as if nature in producing highly organized beings achieves her completest syntheses. To call them minds appears but to give them another name. We thus approach something like the conception of Aristotle, that mind is not simply the thing which knows nature, but is, perhaps, nature's completest realization. The consonance of this view with the theory of evolution and with the relational theory of consciousness attained by an analytic study of reflective experience is so apparent that no detailed exposition of it seems necessary.

The brevity of the exposition of the nature of consciousness here presented has given it, I hope, clearness and precision which greater detail might have obscured. I should like, however, in conclusion, to emphasize again one of the considerations of the preceding paragraph. It is customary with philosophers to speak of the flux of things and to point out that the flux takes an order only because there arise within it certain factors of sufficient relative stability to provide for repetition and sequence under the control of such connections as may exist among the elements of the flux itself. Now the stability given to the organism by the nervous system is manifestly different from what it would otherwise have. It is a stability by means of which the flux of sensation takes an order. In spite of the variety of sensation the nervous system changes slowly and, with its changes, undergoes at the same time increasing internal coordination. The order, therefore, which sensations take in consequence would appear to be subjected to this movement of internal coordination. There thus exists amid the flux of sensation a factor which is not only relatively stable, but which has a stability of such a kind that the movement of internal coordination is relatively independent of the external movement of the flux. Thus we might say that so much of the flux of sensation is ordered as the internal movement of coordination will allow. This ordering would, consequently, be selective and progressive. One is thus tempted to conclude that in the direction of such considerations as these lies the natural explanation not only of consciousness in general, but also of its more specific forms of memory and imagination.

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DEPENDENCE UPON IMAGINATION OF THE SUBJECT-OBJECT DISTINCTION

THE familiar meaning of imagination is presented in the French definition: "1° faculté que possède l'esprit de se représenter des images des objets; 2° faculté de concevoir des combinaisons que ne fournit pas la réalité."[1] We dwell upon the same fact, presented in the definition from the point of view of the older faculty psy-

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[1] "Dictionnaire Général de la Langue Française," Hatzfeld et Darmesteter, p. 1271.